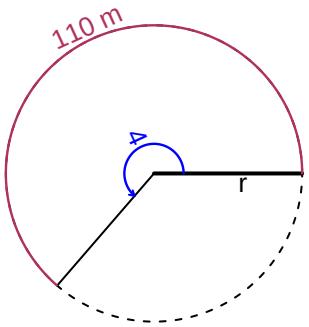
Name: Date:

Trig Final (Solution v36)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 110 meters. The angle measure is 4 radians. How long is the radius in meters?

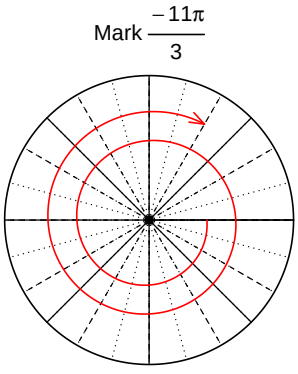


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

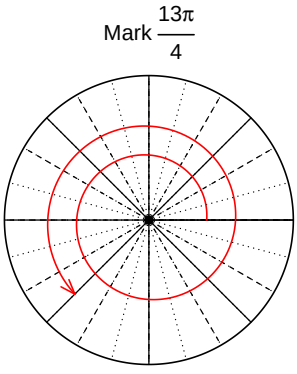
$r = 27.5$ meters.

Question 2

Consider angles $\frac{-11\pi}{3}$ and $\frac{13\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-11\pi}{3}\right)$ and $\sin\left(\frac{13\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\cos(-11\pi/3)$



Find $\sin(13\pi/4)$

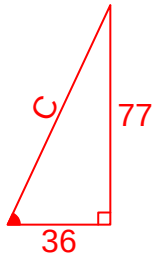
$\cos(-11\pi/3) = \frac{1}{2}$

$\sin(13\pi/4) = \frac{-\sqrt{2}}{2}$

Question 3

If $\tan(\theta) = \frac{-77}{36}$, and θ is in quadrant IV, determine an exact value for $\sin(\theta)$.

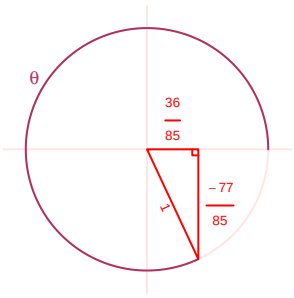
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$36^2 + 77^2 = C^2$$
$$C = \sqrt{36^2 + 77^2}$$
$$C = 85$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\sin(\theta) = \frac{-77}{85}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 6.74 meters, a frequency of 3.95 Hz, and a midline at $y = 8.46$ meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 6.74\sin(2\pi 3.95t) + 8.46$$

or

$$y = 6.74\sin(7.9\pi t) + 8.46$$

or

$$y = 6.74\sin(24.82t) + 8.46$$